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WORK TOWARDS IMPROVING MARKET TRANSPARENCY:

(a) EXAMINATION OF STATISTICS AND REVIEW OF THE CURRENT MARKET SITUATION AND OUTLOOK

Review of the current market situation and medium and long-term outlook

Report by the UNCTAD secretariat

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V. World exports and imports of tungsten by products, 1983-1992

I. SUMMARY AND CONCLUSIONS

1. Despite substantial production cutbacks, the tungsten market has continued to face an extremely weak situation. Enfeebled by the recent recession, the world economy has yet to show signs of any substantial recovery. Most earlier forecasts for 1993 have been revised downward to reflect slower growth rates of major world economies. In addition to the weak economy conditions, the tungsten market has been further affected by changing structural conditions in both the world economy and in industry. Supplies were available at almost any price. Drawdowns of stocks have not helped to strengthen the market which is characterized by a low offtake in a buyers' market.

2. Recent falls in demand have brought world supply to its lowest level since the mid-1960s. World production of ores and concentrates was estimated at 28,684 metric tons in 1992, compared to 35,825 metric tons in 1991. Given the current market conditions, there is little sign of an end to the distress in the tungsten mining industry which witnessed further closures of mine operations in 1993. The rate of capacity utilization had recently fallen below 60 per cent.

3. World consumption of ores and concentrates was estimated at 30,499 metric tons in 1992, compared to 36,628 metric tons in 1991. One of the most significant market developments in recent years has been the increasing consumption of imported intermediate products at the expense of ores and concentrates in major consuming countries. Its market consequences include the closing down of conversion capacities which in the past had thrived on toll conversion business, and the end of the price relationship between tungsten concentrates and intermediate products based on conversion costs.

4. The disruptions caused by the recent economic reform and restructuring in the former Soviet Union have been a further factor contributing to the poor market conditions. It used to import 5,000-7,000 metric tons from China but these shipments were reported to have ceased completely with the end of trade protocols. Recent reports suggest that some materials have been unloaded on the market from sizeable inventories held in stock in the Russian Federation. Even in the absence of precise information, these reports suggest further market uncertainty and downward pressure on tungsten prices.

5. The overhang of materials held in stock remains considerable despite reported stock drawdowns of both intermediate and concentrate materials that have piled up in consuming countries. Some producers and warehouses are reported to be still holding substantial amounts of material. It is also believed that materials recently withdrawn by China through export cutbacks are being held in stock in China.

6. The deteriorating market conditions have led to drastic cutbacks in tungsten trade. Exports of ores and concentrates fell from 24,906 metric tons in 1989 to 7,057 metric tons in 1992 while imports dropped from 23,695 metric tons to 6,734 metric tons over the same period. Trade in intermediate products also suffered, though less severely, down to an estimated 16,024 metric tons from 24,017 metric tons in 1991, with shipments of tungstate being the most seriously affected. Figures relating to trade between China and the United States of America show that shipments of amonium paratungsten (APT) fell from 643 metric tons to 303 metric tons, ferro-tungsten shipments from 525 metric tons to 372 metric tons and shipments of materials described as `other' from 4,782 metric

tons to 1,106 metric tons.

7. The weak tungsten trade and an increased number of distress sales have entrained a collapse of tungsten prices more severe than that which occurred in 1986, when increasing volumes of imported intermediate products became available and were competing with tungsten ores and concentrates. The current collapse has been more severely felt by tungsten ores and concentrates than by other materials including ammonium paratungstate (APT) and ferro-tungsten. Tungsten ores and concentrates were traded between $US 27 and $US 39 per metric ton unit (m.t.u.) at the time of writing, compared to between $US 54 and $US 64 per m.t.u. a year earlier. The value of international trade in ores and concentrates fell to a mere $US 38 million in 1992 compared to $US 502 million in 1980.

8. The corresponding prices for ammonium paratungstate were between $US 34 and $US 39 per m.t.u. compared to between $US 59 and $US 61 per m.t.u. a year earlier in the European free market, and between $US 51 and $US 57 per m.t.u. compared to between $US 69 and $US 77 per m.t.u. a year earlier in the United States free market. As regards ferro-tungsten, the material was available between $US 4.20 and $US 4.50 per kiloramme duty unpaid at the time of writing compared to between $US 5.00 and $US 5.15 per kilogramme duty unpaid a year earlier. In the current market, it appears that the availability of intermediate products rather than ores and concentrates is the more important determinant of market prices since shipments of the former materials at highly competitive prices now account for the larger volume of international trade. Despite the sharp falls in the prices of tungsten materials, consumers of tungsten powder and tungsten carbide powder do not seem to have benefitted from a corresponding reduction in the prices of these products.

9. With current economic forecasts pointing to continued weak performance in major world economies, the prospects for a significant improvement in the tungsten market in the near term seem remote. In the longer run, better prospects exist for an improvement in the market situation for tungsten as the equilibrium between supply and demand consolidates. World demand, which has recently fallen to its lowest level in the past 30 years, should eventually recover to more normal levels. On the supply side, the large-scale capacity expansion witnessed by the market in the middle of the 1980s is unlikely to repeat itself. However, the effect on tungsten demand of a recovery of the world economy is likely to be limited, unless there is a reversal of the structural conditions which seem to have adversely affected tungsten demand to date.

II. RECENT DEVELOPMENTS IN DEMAND

10. Like that of most minerals and metals, the tungsten market has been greatly affected by the current weak economic situation facing the major world economies. In the case of tungsten, however, other developments also have a bearing on the current situation. They include the increased competition between tungsten and other materials in end-use applications, the impact on tungsten trade and consumption owing to the economic reform and restructuring in the former U.S.S.R. and Eastern European countries, the effects of large cutbacks in budgetary and defence expenditure by major military powers, and changes in commercial, marketing and tariff policies affecting tungsten. All have contributed to bringing down tungsten demand to its current very low level.

A. World economic situation and tungsten demand

11. Between 1979 and 1992, the world economy grew on average by only 2.2 per cent per annum compared to 4.2 per annum in the 1970s. The economic slowdown contributed to transform the tungsten market from one facing the threats of shortage for the best part of the 1970s to one now facing an abundant availability of tungsten materials.

12. The sharp declines in the world economic performance between 1980 and 1982, and between 1990 and 1992 were accompanied by sharp falls in tungsten demand (see figure 1). Demand for tungsten had also weakened during the economic slowdown of 1985-1986. Substantial increases occurred only in 1984 and 1988, when the world economy achieved its highest growth rates. The lack of strength in the tungsten market in recent years was marked in 1985, 1987 and 1989 when economic growth rates of over 3.0 per cent failed even to sustain demand at the existing level. When the world economic growth rate collapsed in 1991 and 1992, demand for tungsten experienced its worst setback, albeit in a market situation aggravated by the decline of tungsten demand in the former U.S.S.R. and other Eastern European countries. Figure 1 illustrates that, for various reasons discussed later, falls in global economic growth drag down demand for tungsten but recovery fails to lift it up.

13. World consumption of tungsten decreased for the fourth consecutive year in 1992, down to 30,499 metric tons from 51,262 metric tons in 1988 (see annex I).

The current recession had a more severe impact on the tungsten market than the previous recession of 1982 and 1983. In the two years of 1991 and 1992, consumption fell by a cumulative rate of 31.6 per cent, compared to 15.1 per cent in 1982-1983. With most early forecasts of economic growth rates in the major world economies being revised downwards (annex II), the prospects of a demand recovery look remote, at least in the short term.

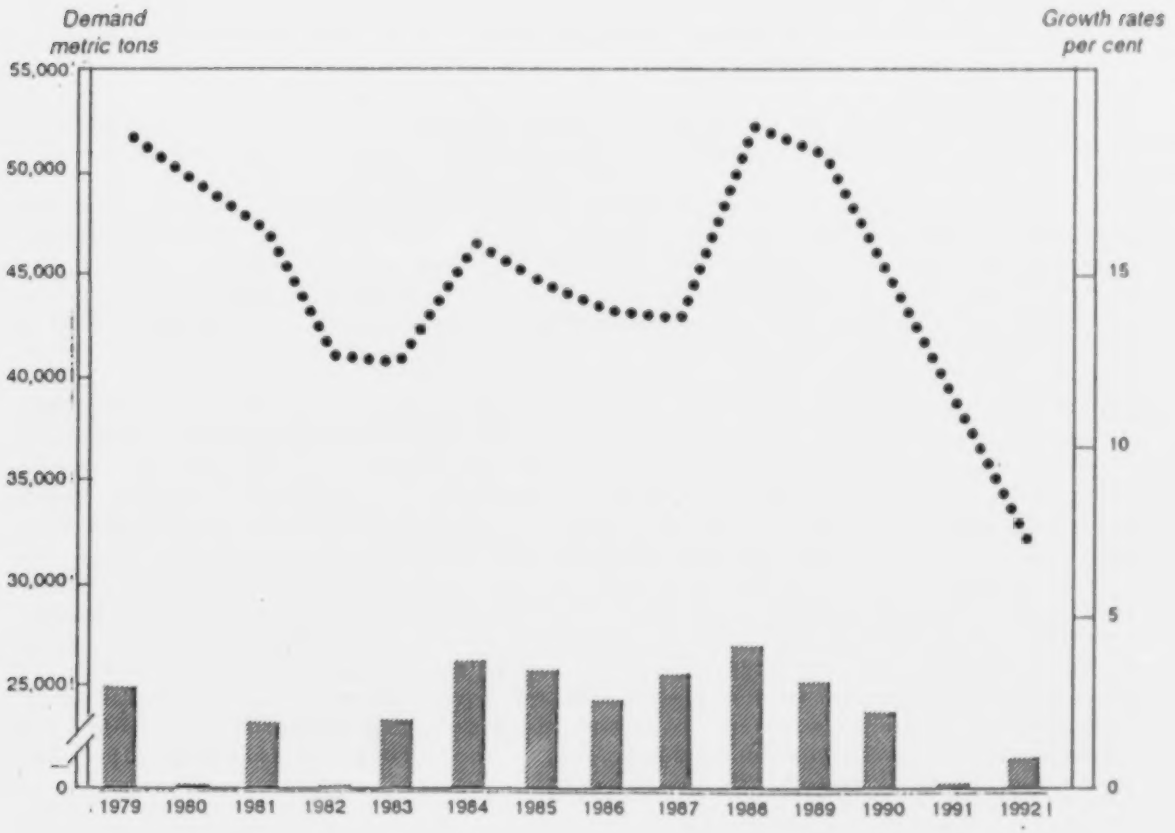
14. The consumption downturn has affected most consuming countries. In 1992, consumption of ores and concentrates in the developed market economy countries fell by 27.5 per cent to 7,509 metric tons compared to 10,351 metric tons in 1991. With their increased preference for imported intermediate products, there are few large consumers of tungsten ores and concentrates left among developed countries. Although consumption of ores and concentrates in Austria and the United States fell by 6.3 per cent and 32.6 per cent respectively in 1992, these countries remained the only two significant consumers of ores and concentrates among the developed market economy countries, accounting together for more than three-fourths of the consumption of the group. Since its mine had been recently put on care and maintenance operation, future consumption in Austria would likely consist entirely of imported material. Consumption of ores and concentrates also decreased in Germany (28.6 per cent) and in Japan (29.5 per cent), but rose in Sweden (29.2 per cent).

15. Among the developing countries, the only country which consumed a significant amount of tungsten was the Republic of Korea, where consumption fell by 10.0 per cent. With its economy achieving growth rates of 7.0 per cent and 12.8 per cent in 1991 and 1992, respectively, estimates of domestic tungsten consumption of China were revised upward to 6,000 metrics tons from 5,000 metric tons. However, in this country also estimated overall consumption of ores and concentrates, comprising both domestic-consumed material and material converted into intermediate products for export has been revised downwards to 13,000 metric tons from 15,000 metric tons in 1991 and 18,000 metrics tons in 1990.

16. Like for most other minerals and metals, consumption of tungsten in the

Figure 1

WORLD ECONOMIC GROWTH RATES AND TUNGSTEN DEMAND



region's industrial output. Gross domestic product declined by over 43 per cent in the three years between 1990 and 1992,[1]/ and major tungsten consuming sectors including mining, oil drilling, steel manufacturing and metallurgy suffered serious setbacks. Estimates of consumption of ores and concentrates in the former U.S.S.R. were put at 7,000 metric tons in 1992, compared to 12,000 metric tons in 1989. Consumption of the rest of the countries of Eastern Europe was estimated at 310 metric tons and 2,350 metric tons in 1992 and 1989, respectively. The sharp fall was attributed principally to the former Czechoslovakia and Poland where tungsten consumption has also been severely affected by recent economic reform and restructuring.

B. Structural changes in the world economy

17. In recent years, tungsten demand has also been greatly affected by changing structural conditions resulting in lower growth rates of tungsten-consuming sectors. Figure 2 shows the growth rates of the petroleum and gas, mining, metal products, machinery and equipment, and heavy manufacturing industries which account together for over 80 per cent of the demand for tungsten.

18. Between 1970 and 1979, the metal products, machinery and equipment, and heavy manufacturing industries were among the fastest-growing economic sectors, providing strong growth impulses to tungsten demand. The growth rates of these sectors were higher than that of the world economy except in the recession of 1975 when tungsten demand suffered a major setback. In the late 1970s, these sectors achieved exceptional growth rates which were not only rising but also largely exceeded GDP growth rates, contributing greatly to the substantial increases in tungsten demand in those years. The other major tungsten-consuming sectors such as petroleum and gas, and mining, had also experienced strong growth rates during that period although their performance was below the average of other sectors.

19. However, a different picture has emerged since 1980. These industries have been experiencing lower growth rates, and indeed in many cases stagnating or even declining. The worst hit has been the mining sector. Despite upturns in 1983 and 1989, mining output was lower in 1992 than in 1980. The metals products, and machinery and equipment sectors which performed exceptionally well in 1970-1979 also experienced serious setbacks. Except for 1989, they achieved hardly any growth between 1980 and 1992. The petroleum and gas sector did better, largely as a result of the substantial expansions between 1980 and 1982 and between 1987 and 1989. However, its growth rate was considerably low compared with the period 1970-1979.

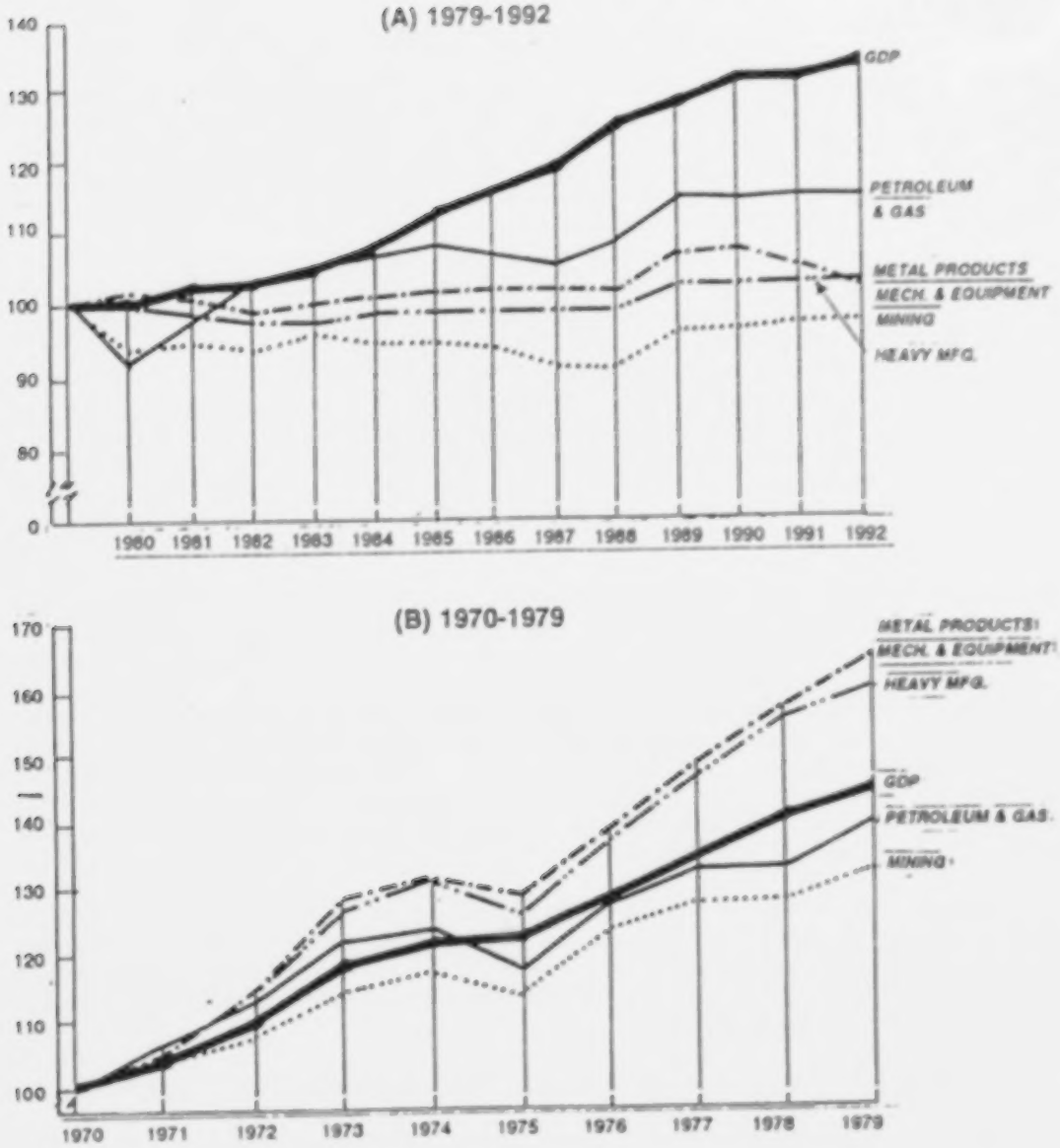
20. The demand for tungsten since the beginning of 1980s has consequently suffered not only from overall low economic growth rates but also from changed structural conditions. The indications are that the structural trends which had entrained weakened growth in the above sectors were unlikely to change substantially in the years to come.

C. Substitution, tool coatings and other technological changes

21. Besides deteriorating economic conditions, the recent situation in the tungsten market has also been influenced by substitution, tool coatings and other technological changes, and an increased availability of materials competing with tungsten as the science of powder metallurgy progresses. These factors have considerably changed the structural conditions of the tungsten market, resulting in a net negative effect on world demand for tungsten although

Figure 2

PERFORMANCE OF MAJOR TUNGSTEN-CONSUMING SECTORS
IN THE WORLD ECONOMY, 1970-1979 AND 1979-1992



some of their effects have recently been mitigated.

22. During the period of soaring tungsten prices in the late 1970s and early 1980s, the largest inroads into tungsten consumption were made by materials such as depleted uranium, ceramics and cermets, and molybdenum steel tools. Large gains were possible in terms of cost savings through the substitution of these materials for tungsten. Depleted uranium was substituted for tungsten mainly for making armour-piercing penetrators but also as counterweights, flyweights and other balancing applications. With the expansion of nuclear reactors to produce energy, particularly following the oil crises of the 1970s, depleted uranium became abundant and readily available, mostly from domestic sources. Public opposition to its use for reasons of environmental risks and health hazards was then less vocal for one reason or another.

23. Ceramics and cermets have also been cheap and in relative abundance. Ceramics are substitutes for tungsten in some grades of metal-cutting tools and wear parts, while cermets are substitutes for tungsten in cutting tools, rocktools and wear parts. Although new techniques such as the use of whiskers have recently been developed, the use of ceramics has been greatly limited by the brittleness of this material which still accounts for less than 5 per cent of the tool market. Cermets have been more successful in gaining market acceptance. The use of cermets was strongly promoted in Japan during years of high prices in the 1970s and early 1980s, and also for their speed and high productivity in some cutting operations. Such materials now account for some 30 per cent of the Japanese market. Their inroad in Europe and the United States have been more limited but progress is reported.

24. Before the introduction of tungsten carbide drilling bits and tungsten carbide tool inserts, tool steel accounted for over 30 to 40 per cent of tungsten consumption. At present, it accounts for 15 to 20 per cent of tungsten consumption.[2/] Molybdenum is a substitute for tungsten in tool steel. The competitiveness of molybdenum steel was accentuated during the 1970s with the soaring prices of tungsten. It is in the automotive industry where molybdenum steel competes strongest with tungsten steel. In other applications, such as in the mining industry, molybdenum steel suffers a number of limitations, for example in terms of hardness, which makes it inferior to tungsten steel in terms of reliability, particularly on harder surfaces. Tungsten steels are also more versatile specially where the same tools are relied upon to execute diverse operations.

25. The substitution of other materials for tungsten in applications other than the above has been greatly limited, particularly where tungsten constitutes only a fraction of the total cost. Thus, the demand for tungsten in such uses as lamp filaments and as catalyzers in the oil industry has been less threatened by substitutes even during the high prices of the late 1970s and the early 1980s. But demand for such uses makes up only a small proportion of total consumption of tungsten. Even in these cases, for example, lamp filaments, progress has been achieved, for example, in filaments that last longer and new systems of lighting have appeared on the market.

26. The negative effect of substitution on tungsten consumption which occurred during the period of high prices is still being felt despite the substantial decreases in tungsten prices and the abundant availability of supply in recent years. Tungsten has not regained all the ground lost to rival products; in some areas of application it faces more competition as new products are put on the market. Many of the substitutes were adopted or developed for improving

efficiency as well as for reducing production costs. The reversal of the former type of substitution is more difficult, as for example in the case of cermet, the use of which may have slowed down in industry but not stopped.

27. World demand for tungsten has also been greatly influenced by technological improvements such as in coating techniques, improved tool geometry, near-net-shape techniques and downsizing and the increasing use of composite materials at the expense of metallic products in industry. The use of coatings increases tool performance through an increase in tool life, in many operations by a factor of 2 to 10. Furthermore, with coated tools, operation speeds have been considerably increased leading to greater productivity. In 1985, it was estimated that worldwide more than 70 per cent of the inserts for turning were coated and the overall figure for all inserts was above 50 per cent. The progress in coated tools has not ceased since then and the potential for progress outside Japan, the United States and Western Europe is considered to be even greater.

28. In comparison with the late 1970s and early 1980s, the negative effect on consumption owing to improved tool geometry, near-net-shape techniques and downsizing has been more limited in recent years. It is likely to remain low since there are apparently limits to the progress possible in these areas. Perhaps a more important factor affecting demand of tungsten in the future would be the increasing use of composite and non-metallic materials, such as plastics, to replace metallics for many structural and engineering applications in industry. Tungsten tool demand is affected by such substitution to the extent that its use leads to reduced or different tool requirements.

III. RECENT DEVELOPMENTS IN SUPPLY

29. In a situation of falling demand, the adjustments needed through production cutbacks have been extremely painful for tungsten-producing countries as measured by closed-down mining and processing capacities and lost earnings. Moreover, as a result of the adjustments, the number of suppliers has been seriously reduced in a market where a potential fear of supply dislocation prevails owing to the heavy dependency on imports in consuming countries.

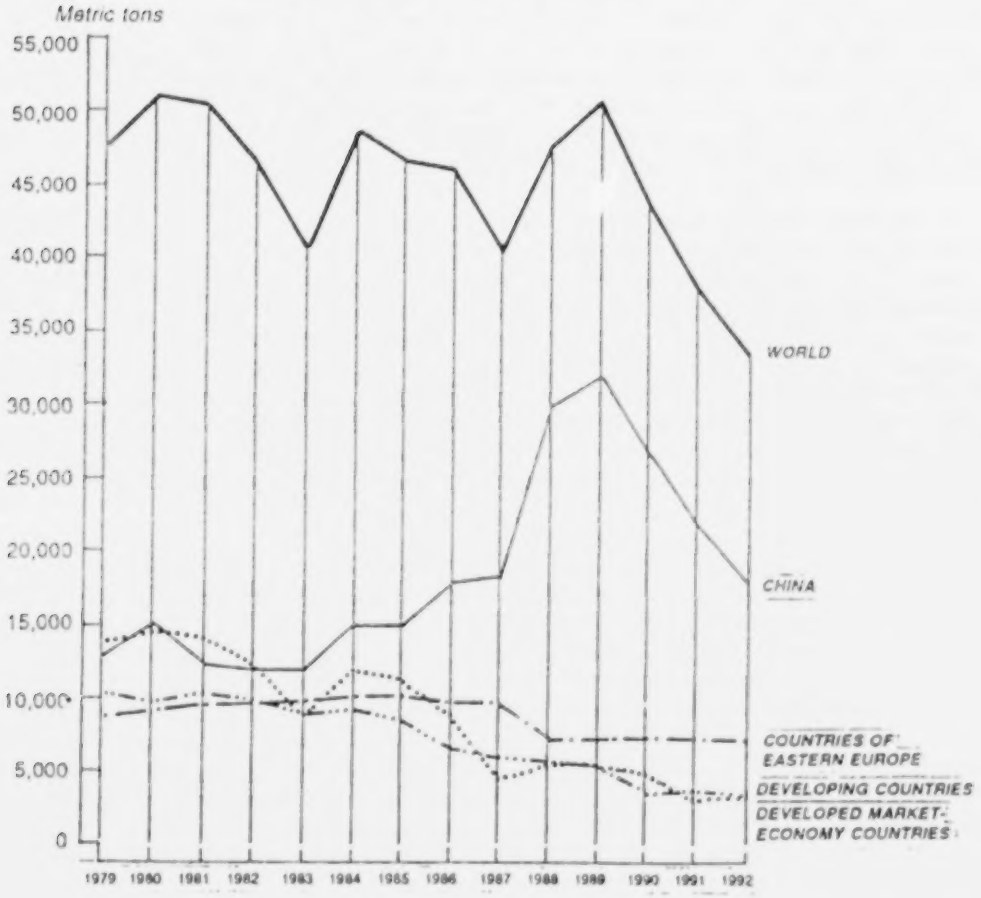
A. World supply of tungsten

30. Figure 3 shows the evolution of world supply of tungsten from 1979 to 1992. World supply is here defined as equal to the total of mine production of ores and concentrates of developed market-economy and developing countries, the estimated mine production of countries of Eastern Europe and the estimated supply from China. The latter aggregate consists of estimated domestic consumption of tungsten in China itself, Chinese exports of ores and concentrates, and imports of intermediate products of consuming countries from China.

31. The world tungsten market entered the 1980s with world supply still rising to reach over 51,000 metric tons, largely as a result of expanded mine capacities in the late 1970s. But the situation deteriorated rapidly as the world economy plunged into the recession of 1982-1983. Substantial market gluts followed; world supply fell by 17 per cent in the same two years. There was a substantial recovery of supply in 1984 in response to improved market conditions. However, the market weakened in subsequent years, making adjustments through supply cutbacks again necessary until the strong economic upturn of 1988-1989 brought a 26.7 per cent increase in world supply, which

Figure 3

WORLD SUPPLY OF TUNGSTEN



reached a new peak of over 52,000 metric tons in 1989 (annex II). However, as demand plummeted in the wake of recession in industry and the drastic consumption cutbacks in the former U.S.S.R., world supply dropped for the next three years to reach less than 29,000 metric tons in 1992. With the recent supply cutbacks, world supply had fallen to its lowest level since 1967.

32. The burden of supply cutbacks has fallen most heavily on the developed market-economy countries where mine production is down by more than three-fourths, dropping from 13,776 metric tons to 3,229 metric tons between 1979 and 1992. The economic recession of 1982-1983, the price collapse of 1985-1986 and the more recent economic recession of 1991-1992 marked substantial cutbacks in their mine production, while the strong economic situation of 1984-1985 and 1988-1989 brought only limited upturns in their mine production. Their total mine production has now fallen to about the level of developing countries.

33. The developing countries have also been forced to cut back mine production but their cutbacks were less substantial than those of developed market-economy countries. The market situation between 1979 and 1992 reduced mine production of developing countries by two-thirds, from 10,166 metric tons to 3,105 metric tons. The cutbacks have fallen mostly on ore-exporting countries. Even in these cases, a number of factors including the depreciation of local currencies, the need to earn foreign exchange and the social costs of closure have cushioned the full impact of market forces. However, if market conditions continue to deteriorate, further cutbacks are inevitable. Production for 1993 already looks likely to be lower still as a result of curtailment of production in Bolivia and Peru.

34. As regards China, the supply and marketing of its exports changed greatly during the period under review. The composition of its exports, hitherto consisting mainly of ores and concentrates, changed greatly as from 1984 when both its mining and processing capacities expanded substantially. Its large tungsten reserves and rural labour force have favoured the development of tungsten mining. Tungsten mining expanded in both the 1970s and the 1980s; but the expansion in the latter period took place in more difficult market circumstances. China's supply, which had fallen to an estimate 12,000 metric tons from 15,000 metric tons during the recession of 1982-1983, increased successively to reach 33,000 metric tons in 1989, most of which were exported in the form of intermediate products. There have been sharp cutbacks in recent years in the face of worldwide recession and the end of trade protocols with Eastern European countries. In 1992, Chinese production of ores and concentrates was estimated at 14,000 metric tons, down from 20,000 metric tons in 1991 and 27,000 metric tons in 1990.[3]/

35. Following the rapid expansion in the 1980s, the question of whether the Chinese tungsten industry is capable of expanding with the same ease in the future is important for the examination of prospects in the tungsten market. Apart from the stated policy of the Chinese Government to protect mineral resources, including tungsten, from reckless exploitation,[4]/ production costs are bound to rise as the more accessible mines are exhausted and wage levels improve. Although future expansion is possible, the current ratio of mine capacities to ore reserves in China would suggest that such expansion would be unlikely to happen with the same ease or similar production costs as in the 1980s. Furthermore, as the country moves towards a more market-oriented economic system, mining operations may be expected to stand on their own with reduced official support. Subsidies to tungsten mining were recently reported to have been dropped, leading to the closure of a number of operations.[5]/

36. Mine production in the former U.S.S.R. accounted for the main domestic source of supply in the countries of Eastern Europe where consumption has recently been greatly affected by economic reform and restructuring towards a more market-oriented economy. However, the cutbacks in consumption are assumed to have affected mainly imported materials. Domestic supply in the former U.S.S.R. was estimated at around 9,000 to 10,000 metric tons between 1979 and 1987, a figure recently revised downward to 7,000 as industrial production fell. Some 85 per cent of tungsten production has been attributed to the Russian Federation and the rest to Kazakhstan and Uzbekistan. Hitherto, the Russian Federation has played only a limited role in international trade but its large reserves as well as reported inventories in stock could greatly change the picture in future.

B. Stock movements

37. In 1992, production cutbacks, further closures of mine operations, greater supply restraints and poor market prospects seemed to have combined to contribute to a further drawdown of the large stocks accumulated in the consuming countries during 1988 and 1989. Although the size of stocks held in inventories is not fully known owing to lack of data, despite the recent drawdowns materials remaining in stock are believed to represent a considerable overhang still given the present flat market situation.

38. Reported commercial stocks (producers', consumers' and traders' stocks) held in reporting countries amounted to 4,744 metric tons, down by 18.6 per cent, further to the decreases of 2.5 per cent in 1991 and 2.1 per cent in 1990 (Annex III). The 1992 commercial stocks were equivalent to six months' consumption of the developed market-economy countries and developing countries at their 1992 consumption level, which is considered to be a high level by usual commercial practice. Moreover, it is widely believed, though difficult to substantiate, that the recent Chinese export cutbacks are being held back in stock in China while stockpiled materials held in the former U.S.S.R. are becoming available for release. It is also believed that unreported materials are held in warehouses such as in Amsterdam and Hong Kong.

39. The larger part of the reported commercial stocks consisted of materials held as involuntary stocks by producers. The unremunerative market conditions in recent years have forced them to withhold their tungsten rather than to sell it at excessively low prices. In 1992, reported producers' stocks amounted to 2,866 metric tons, down by 5.7 per cent further to the decrease of 20.6 per cent in 1991. The fall in 1992 occurred mainly in Australia as a result of stock liquidation following the closure of its last tungsten mine. By contrast, producers' stocks rose in Japan, Mexico, Portugal and Thailand. The latter two countries accounted for over 82 per cent of the total reported producers' stock, equivalent, respectively, to some 8 and 380 months of their exports at 1992 levels. In the case of producing countries such as Thailand, it would need a substantial market recovery to absorb the large accumulated stock.

40. Reported consumers' stocks were down to 1,848 metric tons compared to 2,733 metric tons in 1991. The drawdowns occurred mostly in the United States, where there was a sharp increase of consumers' stocks in 1991 largely resulting from buying in anticipation of the anti-dumping legislation which was subsequently enacted later in the year against imports of ores and concentrates from China. The level of consumers' stocks in the United States stood at 702 metric tons at the end of 1992. The recent drawdowns reduced consumers' stocks in the United States to less than the equivalent of two months of its consumption at the 1992

rate. In contrast, consumers' stocks rose in Japan.

41. The stock level of intermediate products is even more difficult to quantify, particularly as regards undeclared stocks.[6]/ The available figures on stocks of ammonium paratungstate (APT) also show some drawdowns recently following the 1988 and 1989 increases. Reported APT stocks amounted to 1,003 metric tons in 1992, down by 30.2 per cent, further to decreases of 14.2 per cent in 1991 and 6.0 per cent in 1990. While such stocks fell in the United States in 1992, they rose in Sweden.

C. Scrap recycling

42. Recycled tungsten or secondary-tungsten-recovered-from-scrap accounts for a substantial proportion of tungsten consumption. Because of the lack of information, the discussion of this topic is limited to Japan, the United States and Western Europe. Even in these cases, the information is far from complete. On the basis of available information, the proportion of recycled tungsten in total tungsten consumption is estimated to vary between 20 and 30 per cent, depending on year and country, as well as on a number of other factors. The latter factors include the cost of collecting and recycling the scrap, the value of co-products and the price of primary materials. In the 1980s, the value of most co-products, like other primary products, was generally depressed.

43. Recently, an increase of scrap recycling has been reported in Germany, Japan and the United States. This has been a result of increases in the price of cobalt which is recovered together with tungsten during recycling of cemented carbide scrap. The anti-dumping tariff duty of 151 per cent on imported Chinese ores and concentrates has been an additional incentive in the United States.

44. Unfortunately, Japan has ceased to report figures of imports and exports of tungsten scrap since 1988. Consequently, it is difficult to determine whether the reported increase in the consumption of scrap is due to an increase of domestically collected scrap or to an increase of imported scrap. In the case of the United States, it does appear that the recent increase has been due to a net increase of imports over exports of scrap. This development also appears to be true in the case of Germany, the main scrap-recycling country in Europe. There is no evidence that the types of scrap collected in these countries have changed so greatly as to result into a substantially higher proportion of tungsten scrap being collected for recycling.

45. On the basis of available information, therefore, it would seem that the consumption of tungsten scrap, although it may greatly vary from one year to another, has not had a substantial effect on the demand trends in the tungsten market during the period considered. Unless there is a significant change in the legislative requirements in the various consuming countries regarding recycling of waste materials, including tungsten scrap, a substantial reduction in collecting costs, or a sharp increase in tungsten prices, the proportion of the different types of tungsten scrap collected for recycling in relation to uncollected scrap is unlikely to change significantly.

D. Developments in mine capacity

46. The recent market situation has reduced the world mine capacity through mine closures, particularly in the developed market economy and developing countries. The numbers of mines in operation, 60 in the developed market economy countries and 74 in the developing countries at the peak of world supply in 1980, were

reduced to only 6 and 25, respectively, by 1992 (Annex IV). The larger mines in the developed market economy countries were often among the first victims of the deterioration in market conditions. Canadian Tungsten was among the first hit by the depressed prices in 1982-1983, as were some Australian and United States mines which were opened in the later part of the 1970s. However, the largest number of mine closures occurred in 1985-1986 with the collapse of tungsten prices.

47. In the developing countries, difficulties in the mining sector had already started in the 1970s in the face of rising production costs particularly for energy, spare parts and other imported inputs. On the other hand, mine operations in developing countries consist of relatively smaller mines which have been less vulnerable than the larger mines in the developed countries in times of market contraction, sharp price falls and rising labour costs.

48. Many mines which have ceased operation have been put on care and maintenance. They represent substantial idle capacities. As a result, the tungsten industry is currently suffering from a substantial capacity under-utilization. It is estimated that the rate of capacity utilization in the tungsten mining industry has dropped to below 60 per cent recently compared to above 95 per cent in 1979 when the world was facing supply shortages.

IV. DEVELOPMENTS IN INTERNATIONAL TRADE OF TUNGSTEN

A. Developments in trade policy

49. In the face of difficulties confronting the domestic tungsten industry, mounting pressure has recently been reported for the introduction of new tariff duties in major consuming countries to protect domestic markets. Chinese ores and concentrates are already subject to anti-dumping duties of 37 per cent on material supplied by CNIEC (China National Non-ferrous Metal Import and Export Corporation) and 42.4 per cent on material imported from other Chinese sources including MINMETALS (China National Metals and Minerals Import and Export Corporation) in the European Community countries, and to an anti-dumping duty of 151 per cent in the United States.

50. Nevertheless these duties are regarded as insufficient by some sections of the domestic market. Pressure has continued to be exerted by some domestic intermediate product producers in the United States to extend the anti-dumping duties to cover also intermediate products. Hitherto, the most-favoured-nation (MFN) status granted to China was applied to United States imports of intermediate products from China. Without the MFN status, duties on APT would rise from 10 to 49.5 per cent, and duties on tungsten carbide from 10.5 to 55.5 per cent. In the case of ores and concentrates, the imposition of an anti-dumping duty de facto cancelled the MFN advantages for these products. In other major consuming countries, there has been less pressure for protectionist legislation against imported intermediate products which are commercially regarded in a more favourable light, particularly by powder producers who depend on the export market.

51. Developments have also been reported in the trade policy of China in order to deal with the difficulties faced by its tungsten industry, particularly the oversupply situation. A more centralized procedure to control the issuance of export licenses for tungsten concentrates and intermediate products was adopted, effective from 1 April 1993.[7]/ Under the new ruling, the CNIEC and MINMETALS remain the main outlets of exports of Chinese tungsten materials but it curtails

the provincial and local autonomy to export tungsten materials. Export licenses must be obtained from the main office of the Ministry of Foreign Economic Relations and Trade (MOFERT) in Beijing through the CNIEC and MINMETALS head offices. Prior to this new ruling, licenses could be issued by local branch offices of MOFERT. Consideration of co-ordinating the export trade in tungsten through a joint-venture company to be established by CNIEC and MINMETALS was also reported since quite some time but this project has apparently not yet materialized.

B. Trade in tungsten ores and concentrates

52. Trade in ores and concentrates has suffered from substantial falls in recent years (Annex V). If prevailing trends continue, as appear likely, ores and concentrates would account for only a marginal part of the trade in tungsten material. This has already happened in many consuming countries including, for example, France, Germany and the United Kingdom. For most consumers, it is more convenient both for economical and environmental reasons to import intermediate products instead of concentrates as feedstuff material for processing into upmarket tungsten products. Toll conversion has virtually dried up in many consuming countries.

53. World imports of ores and concentrates were down for the third consecutive year to 6,734 metric tons in 1992, from 14,426 metric tons in 1991, 18,759 metric tons in 1990 and 23,695 metric tons in 1989.

54. There were few significant importing countries of ores and concentrates left among the developed market-economy countries. As a group, their imports of ores and concentrates fell by 62.1 per cent to 3,638 metric tons in 1992. The decrease reflected the sharp decline of imports into the United States which accounted for the largest amount of ores and concentrates imported by consuming countries. Its imports fell by 68.4 per cent to 2,477 metric tons. With its anti-dumping duty of 151 per cent imposed on imports from China, shipments from the latter country dropped to only 15 metric tons compared to 3,185 metric tons in 1991.

55. Imports also fell in Austria from 226 metric tons to 100 metric tons, in Germany from 308 to 250 metric tons, in Japan from 720 to 424 metric tons and in Sweden from 221 to 200 metric tons. While consumption of imported ores and concentrates shrank drastically in these countries, it ceased in France, Italy and the Netherlands, and virtually ceased in the United Kingdom. The structural adjustments required to change from consuming imported ores and concentrates to consuming imported intermediate products as the basis feedstuff seemed to have proceeded more steadily in Western Europe than elsewhere; and the anti-dumping duties imposed by the European Community had apparently succeeded in only accelerating the transformation.

56. In 1992, imports of ores and concentrates showed an improvement in developing countries but a sharp drop in countries of Eastern Europe. Developing-country imports, consisting mainly of shipments to the Republic of Korea and shipments for entrepot trade of Hong Kong and Singapore, rose from 2,370 metric tons to 2,736 metric tons. In the Republic of Korea, the increased imports replaced domestic production of ores and concentrates which had ceased as a result of the closure of the Sangdong tungsten mine.[8] By closing down its own tungsten mines in the face of rising production costs, Korea Tungsten Mining seems to have succeeded in maintaining its conversion plant in operation using imported ores and concentrates which it converted into tungsten products for

both its domestic and overseas markets.

57. As regards countries of Eastern Europe, imports of ores and concentrates suffered a drastic drop, which was accompanied by the end of shipments from China to the former U.S.S.R. Imports of ores and concentrates of these countries were estimated at 360 metric tons, compared to 2,460 metric tons in 1991 and 6,200 metric tons in 1990. Poland has reported no imports of ores and concentrates since 1989. There are recently reports that efforts are made by the republics of the former U.S.S.R. to market large quantities of surplus tungsten material, which, if correct, would convert the former U.S.S.R. from a net importer to a net exporter of tungsten.[9]

58. Total world exports were estimated at 7,057 metric tons in 1992, compared to 11,931 metric tons in 1991 and 16,539 metric tons in 1990. Faced with anti-dumping duties and the lack of enthusiasm for trade of ores and concentrates under present market circumstances, Chinese exports were down, despite the lifting of the ban on exports, to 1,198 metric tons from 3,127 metric tons in 1991, 8,472 metric tons in 1990 and 15,914 metric tons in 1989.

59. The drastic drops in export shipments from developed market economy countries in the 1980s have continued as a result of the recent sharp demand downturn, the collapse of world tungsten prices and the closure of their mine operations on an unprecedented scale. In 1992, the exports of these countries fell to 1,519 metric tons compared to 2,696 metric tons in 1991. During the same period, exports of developing countries fell to 3,540 metric tons from 4,808 metric tons. The fall in developed market-economy country exports occurred mainly in Australia and Portugal, both of which suffered recently from further mine closures. The fall of developing country exports occurred mainly in Bolivia, Mexico, Peru and Thailand. The re-export trade of Hong Kong and Singapore also fell.

60. The deteriorating market prices, drops in export volume and distress sales by some producers have played havoc with the export earnings of producing countries, which have declined drastically in recent years. Except in 1989, when there was a modest improvement, the total value of world exports has continued to dip since 1980 when exports of ores and concentrates represented a business of $US 502 million. The recent falls had brought this value down to a mere $US 38 million in 1992.

C. Trade in intermediate tungsten products

61. Tungsten as a material is imported in several countries increasingly in the form of intermediate products instead of ores and concentrates. The international trade in intermediate products used to consist largely of intra-trade among the major consuming countries, a situation which has greatly changed since the expansion of downstream processing in producing countries, particularly in China and the Republic of Korea.

62. With almost no exception, the major consuming countries are now net importers of such products as ferro-tungsten, tungsten oxides and hydroxides, and tungstates, which need relatively simple technologies for processing and can easily be integrated into the mining sector of the producing countries. Upper-market intermediate materials, including tungsten carbide and tungsten powder, are also becoming increasingly available from China and the Republic of Korea.

63. In 1992, exports of intermediate products fell to 16,024 metric tons from

24,017 metric tons in 1991 while imports dropped to 18,187 metric tons from 25,406 metric tons (annex V). The fall was attributed mainly to decreased shipments of tungstates and unwrought tungsten (consisting largely of tungsten powder), which together accounted for more than two-thirds of the trade in intermediate products.

64. Figure 4 shows the relative shares of tungsten products, including tungsten ores and concentrates, in the overall trade in tungsten materials in 1883 and 1992. Tungsten ores and concentrates accounted for only 30.6 per cent of such trade in 1992 compared to 69.9 per cent in 1983. The largest gains were made by tungstates and unwrought tungsten, which accounted for 25.5 per cent and 20.8 per cent, respectively, of the international trade in tungsten materials in 1992 compared to 6.2 per cent and 8.3 per cent, respectively, in 1983. Gains in market share were also made by ferro-tungsten and tungsten carbides with their proportions rising to 8.7 per cent and 10.1 per cent, respectively, compared to 2.2 per cent and 8.8 per cent, respectively, in 1983. The only intermediate materials whose share has regressed are tungsten oxides and hydroxides, a trade which has not attracted great interest from consuming countries. They accounted for only 4.3 per cent of the international trade in 1992 compared to 4.6 per cent in 1983.

65. The decreased shipments of intermediate products in 1992 reflected decreases of Chinese exports. The largest decrease was in the shipment of tungstate which dropped to 5,900 metric tons, down from 10,413 metric tons in 1991, owing to weak market demand and the shutdown of numerous APT plants in China.[10]/ Trade between China and the United States shows that APT shipments dropped from 643 metric tons to 303 metric tons while ferro-tungsten shipments fell from 525 metric tons to 372 metric tons over the same period. However, the largest fall occurred in shipments described as other materials,[11]/ which fell from 4,782 metric tons to 1,106 metric tons.

66. There have also been numerous recent reports about exports of tungsten by the CIS republics. Although no precise export figures have been provided, such reports indicate that a variety of tungsten materials as well as products were being made available in this region. The offers include tungsten oxide, metal and carbide powders, wrought tungsten and end-use products such as cutting tools, drill bits and wear parts.[12]/ With the sharp falls of domestic consumption, particularly in the steel, energy, mining and defence industries, surplus materials appear to have become available either for export to earn foreign exchange or for counter-trade to exchange for needed imports. Under present structural conditions of the domestic tungsten industry, it would seem that the CIS republics would not likely remain a significant source of exports once their surplus materials were exhausted.

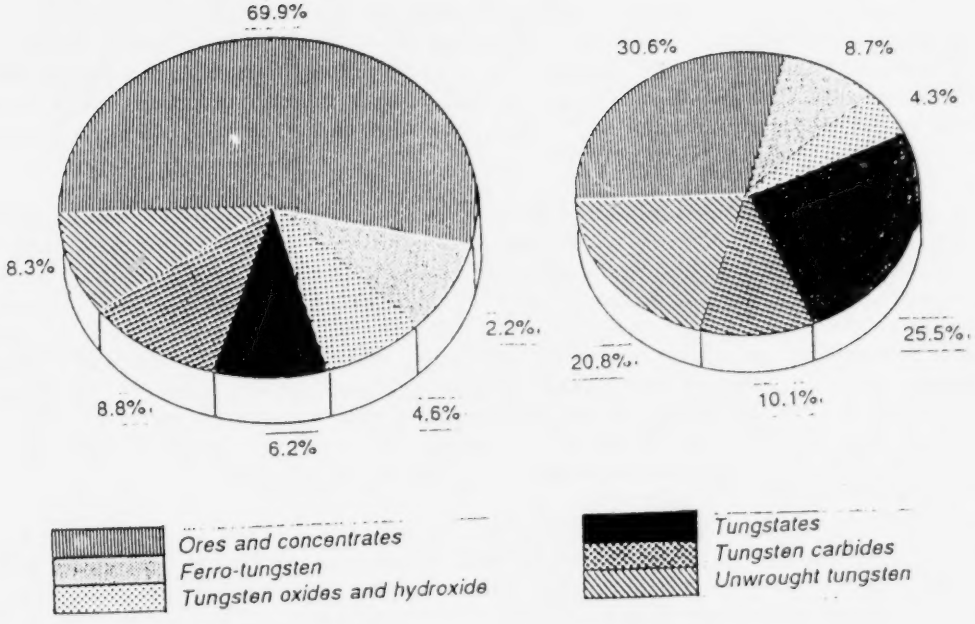
V. RECENT PRICE DEVELOPMENTS IN THE TUNGSTEN MARKET

A. Prices of tungsten ores and concentrates

67. In comparison with the average price of minerals and metals, tungsten had not only fallen faster during periods of recession such as in 1982 and 1986 but it had also failed to recover as much during the demand upturns of 1984 and 1988. The Gulf War coupled with the announcement made by China to suspend exports of ores and concentrates in early 1991 and the buying underpinning demand in anticipation of the anti-dumping duty on imports of Chinese ores and concentrates into the United States saw an improvement in tungsten prices. The improvement was, however, unsustainable with the collapse of demand in 1992 in

Figure 4

MARKET SHARES OF TUNGSTEN PRODUCTS IN INTERNATIONAL TRADE,
1983 AND 1992



the wake of severe recession in major world economies. The situation had further deteriorated in 1993 with tungsten prices reaching their lowest level since the mid-1960s.

68. According to Metal Bulletin quotations, the tungsten market had begun to slide after reaching a peak of between $US 59 per m.t.u. and $U.S 67 per m.t.u. in the latter part of 1991. In 1992 tungsten ores and concentrates were traded between $US 57 per m.t.u. and $US 66 per m.t.u., quite favourable when compared with the price range of $US 39 per m.t.u. to $US 49 per m.t.u., at which ores and concentrates had been traded in the corresponding period the previous year.

69. Concentrate prices stayed relatively stable until they started to drift lower in the second quarter of 1992 with parcels of ores and concentrates settled at between $US 55 per m.t.u. and $US 64 per m.t.u. by the end of the quarter. However, the deterioration of prices gathered momentum in the face of low market offtake, the lack of buying interest, and offerings of Russian material,[11]/ coupled with distress sales by some small producers. The Metal Bulletin quotations showed accelerated softening of rates reaching a range of between $US 51 and $US 60 per m.t.u. at the end of the third quarter and between $US 40 and $US 50 per m.t.u. at the end of the fourth quarter, thus shedding off in a relatively short time virtually all the gains made in 1991, during the Gulf War and its immediate aftermath.

70. With market improvement looking remote as the market entered 1993, the supply cutbacks and mine closures in China and other countries did not offer much prospect of relief to crumbling prices. Prices slid further with ores and concentrates quoted at between $US 32 and $US 43 per m.t.u. at the end of the first quarter of 1993. Indications were that the price fall had not yet touched bottom despite prices that were already lower than in 1986 when the tungsten market last collapsed. Further price slides in the second quarter of 1993 weakened prices of ores and concentrates being quoted at between $US 27 and $US 39 per m.t.u. at the time of writing, a level at which tungsten ores and concentrates had not been traded since the mid-1960s.

71. Owing to the low buying interest and the reduced size of the concentrate market caused by imported intermediate products, the offer of even a few metric tons from a concentrate supplier recently had had a disproportionate impact on market prices. Some sales were settled at such a low price level that they could only be described as distress sales in an intensively competitive market. Among settlements concluded at below the prevailing Metal Bulletin quotations were the reported sales of 40 metric tons of Burmese material in May 1992, Ugandan concentrates at below $US 30 per m.t.u. towards the end of 1992, and some Latin American concentrates at less than $US 30 per m.t.u. at the start of 1993. Although the material involved lower grade, these examples illustrate the recent pressure which has led prices to drift lower and lower.

B. Prices of intermediate tungsten products

72. With the increased availability of imported intermediate tungsten products since 1984, the latter products had become competitive with ores and concentrates, unlike in the past when prices of intermediate materials were closely linked to prices of imported ores and concentrates through conversion margins corresponding to the costs of conversion plants. This link has been broken as some producing countries, particularly China and the Republic of Korea, began to export their tungsten increasingly in the form of intermediate products. As a result, the price differentials which used to represent the mark-

up for conversion costs had grown increasingly narrow and, for some grades, had in fact disappeared. Under the circumstances, there was little rationale to reduce the supply of ores and concentrates as a means to strengthen market prices if imported intermediate materials continued to be available in large quantities.

73. The current market weakness which has brought the collapse of concentrate prices has likewise been reflected in prices of intermediate products. The availability of the latter products rather than the availability of ores and concentrates was apparently the more important determinant of market prices since trade in intermediate products now accounted for a larger volume of international trade in tungsten materials. Competing offers persisted between ores and concentrates, on the one hand, and intermediate products, on the other hand. These have alternatively taken the lead in price reduction on the market.

74. The falls in APT prices have shown quite different patterns in Western Europe compared to the United States. In Western Europe, the market entered 1992 with the material traded at lower prices of between $US 61 and $US 63 per m.t.u., compared to between $US 62 and $US 63 towards the end of 1991. The APT market was subject to increasingly stronger downward pressure as the deterioration in market conditions accelerated during the year. APT prices which stood at between $US 59 and $US 60 per m.t.u. towards the beginning of the second quarter fell to between $US 46 and $US 48 per m.t.u. towards the year-end. With little sign of any recovery of demand as the market started 1993, the material was offered at ever lower and lower prices. At the time of writing, the material was being traded at between $US 34 and $US 39 per m.t.u. on the Western European market.

75. In the United States, APT prices were higher than in Western Europe, owing partly to higher shipment costs and differences in market structure. The APT market in the United States was equally affected by deteriorating market conditions but the price fall has been less severe. The expiry of the Orderly Market Agreement with China did not lead to a flood of Chinese material into the United States. Besides the effect of recession, import demand for APT was further weakened by the drawdown of inventories which had been accumulated in anticipation of the antidumping duties coupled with drawdowns linked to the end of the Gulf War. APT prices entered 1992 with the material traded at between $US 68 and 69 per m.t.u. The fall gathered momentum during 1992, as in Western Europe, but the rate of decline was relatively more moderate. The material was offered at between $US 62 and $US 71 per m.t.u as the market started 1993. Like prices in Western Europe, the fall continued and had reached between $US 51 and $US 57 per m.t.u. at the time of writing. Meanwhile, a larger price differential had appeared between Western European and the United States markets, particularly in respect of higher grade material.

76. Ferro-tungsten has also been traded at lower and lower prices. However, the price slides had begun to slow recently following the sharp falls in 1992, due partly to greater stability in the ferro markets, particularly of molybdenum which is a substitute for tungsten as an additive for making tool steels, and partly to a decrease of competitive price-cutting offers. The recent sharp drop in the prices of concentrates and intermediate products was not matched by similar cuts in ferro-tungsten prices. The material was available at between $US 4.60 and $US 4.90 per kg as the market began 1993. It continued to be traded within this range until the market entered into the second quarter, when prices were reduced to between $US 4.20 and $US 4.50 per kg, where they rested at the time of writing. Since the beginning of 1993, the average price of ferro-

tungsten had fallen by 8.4 per cent compared to 17.8 per cent for ores and concentrates; for APT it was by 14.9 per cent in Western Europe and by 12.5 per cent in the United States.

77. Consumers of tungsten powder and tungsten carbide powder, however, did seem to have benefitted from a corresponding reduction in the price of these products, which remained relatively stable. In United States dollar terms, the available producer price of tungsten powder and tungsten carbide powder had virtually not moved since mid-1991. Tungsten powder was currently available at £ 9.25 per kg. (equivalent to about $US 16 per kg). As regards tungsten carbide powder, the one-micron grade was available at £ 9.75 per kg. Judging from the unit value of imports, producer prices may have been discounted in many cases.

VI. THE MEDIUM- AND LONG-TERM OUTLOOK IN THE TUNGSTEN MARKET

78. A large part of the recent distress afflicting tungsten could be attributed to the recession in the major consuming countries and to an abundant supply of materials. The market reflects the opinion that plentiful supplies of material are available to satisfy demand if it remained as flat as it now was, despite recent stock drawdowns and production cutbacks. A major recovery of world economies would be needed before consumption would benefit and the situation improve in the tungsten market. In the longer term, prospects in the tungsten market would depend on a better balance between supply and demand.

79. On the supply side, was an abundant availability of material. As a result, the tungsten market was persistently a buyer's market. The present oversupply situation was created not only by weak demand but also by the rapid expansion of capacity triggered both by the high prices of the late 1970s and early 1980s, and by the developments in China which saw an increase of mine capacities and capacities for processing upmarket products. However, the ease with which supply had recently expanded may have come to an end. Many mine operations which had closed during the recession of 1982-1983 and the price collapse of 1986 were unlikely to reopen unless tungsten prices at least trebled. Likewise a more market-oriented policy in resource development would likely restrain supply shipments from China, which had expanded unprecedentedly in the late 1980s.

80. Another potential source of supply was the republics of the Commonwealth of Independent States (C.I.S.). Tungsten reserves in these republics, principally Russia and Kazakhstan, were estimated to be the second largest in the world after China. The recent mine production cutbacks in these republics could imply the existence of idle capacities; tungsten materials were also reported to be available for export from surplus stocks accumulated in the past. While surplus stocks would be eventually absorbed by the market, longer-term prospects for strengthening the tungsten market would depend more on the amount of tungsten exported by Russia and the other CIS republics. Their mines were considered to be relatively high-cost operations needing substantial investment. Consequently, they were not considered competitive at prevailing low market prices. Any substantial increase in their mine production for export would probably depend on a major improvement in market prices.

81. Therefore, with regard to supply, the prospects were more favourable for a strengthening of the tungsten market when demand, now at its lowest level since the mid-1960s, returned to a more normal level. On the assumption that supply from China would be less forthcoming, for the reasons given above, there were some reservations that any strengthening of the market might, at least partially, be neutralized by an increase of exports from the CIS republics.

Under the present production conditions, however, the amounts which might thus become available for export would probably not have the same market impact as those witnessed in the tungsten market since the mid-1980s.

82. On the demand side, an upturn in the current economic situation could be expected sooner or later. However, most forecasts of longer-term economic trends have predicted only moderate growth rates in the world economy. In these circumstances, likely scenarios would at best indicate only a moderate increase in tungsten consumption. However, any improvement would probably be affected by the negative effects on tungsten demand owing to changing structural conditions. The slowdown of the major tungsten-consuming sectors in relation to other sectors of the world economy was expected to continue, implying that future world economic growth rates were likely to generate a weaker impact on tungsten consumption. As regards substitution, tool coatings and other technological changes, the largely negative trends for tungsten in the past would probably continue although with a more moderate effect on tungsten consumption. Furthermore, new materials appearing on the market would adversely affect consumption of tungsten unless greater efforts were made to develop new grades of tungsten materials and new applications for tungsten.

83. Meanwhile, the consumption of imported intermediate products at the expense of ores and concentrates in the consuming countries would consolidate. Further, as the volume and share of trade of domestic suppliers of intermediate and upper-market products fell in consuming countries, their number would continue to decline either through the closure of business or its consolidation into larger units.

84. In conclusion, an improvement of tungsten demand from its current low level was expected although any longer-term strengthening would generally be lower than in the past, owing to more moderate world economic growth rates and changing structural conditions. Nonetheless, a better balance between supply and demand could be expected as the market was cut off from sources of cheap supply which had recently accounted for the abundant availability of materials.

85. Currently, developing countries accounted for less than 8 per cent of world consumption of tungsten ores and concentrates. However, there was a great potential for demand growth in these countries as industrial sectors expanded.

Notes

1./ See Statistical Report, published by Statkomitet C.I.S., Moscow. Details are also provided in, the Financial Times (London), 3/4 April 1993.

2./ The percentage of tungsten consumption accounted by tool steel varies greatly from country to country (see Schubert, Aspects of Research and Development in Tungsten and Tungsten Alloys, Refractory Metals and Hard Materials, Vol. 11, 1992.

3./ Production of ores and concentrates of China is estimated on the basis of exports of ores and concentrates, exports of intermediate products, and domestic consumption estimated at 6,000 metric tons in 1991 and 1992. As estimated, Chinese production of ores and concentrates is more appropriately referred to as apparent production since material may move in or out of stock with no information made available.

4./ The State Council (China's highest governing body) has listed tungsten as one of the four special minerals to be under State protection and subject to more restrictive conditions for exploitation (see Newsletter published by the International Relations Department of China Tungsten Industry Association, No. 8, January 1991).

5./ Some details about the size of Chinese production in 1992 were provided in the Metal Bulletin (see CNIEC confirms end to tungsten subsidies, Metal Bulletin, 29 October 1992, page 13).

6./ APT stocks in Rotterdam warehouses were recent estimated at 1,000 metric tons (see Metal Bulletin, 19 October 1992, page 29).

7./ Mineral Industry Surveys, Tungsten in February 1993, the United States Bureau of Mines, 7 May 1993.

8./ Production at the Sangdong mine was discontinued in May 1992 (refer to Mineral Industry Surveys, Tungsten in May 1992, United States Department of the Interior, Bureau of Mines, 12 August 1992).

9./ Tungsten materials and products reported available include tungsten oxide, metal and carbide powder (see Mineral Industry Survey, Tungsten in December 1992, United States Department of the Interior, Bureau of Mines, 5 March 1993).

10./ Of the 100 APR plants in operation, some 62 were reported closed down recently.

11./ They include calcium, potassium, and sodium tungstates, mixtures and materials in chief value tungsten, tungstic acid, unwrought ingots and shots, other unwrought tungsten and materials, wrought tungsten, and other tungsten compounds.

12./ Mineral Industry Survey, Tungsten in December 1992, the United States Bureau of Mines, 5 March 1993.

13./ Refer to Metal Bulletin, 27 June 1993, page 10.

Annex I

World consumption, production and trade of tungsten ores and concentrates by region
1984-1992

(metric tons of tungsten content)

	1984	1985	1986	1987	1988	1989	1990	1991	1992
A. World consumption	47 422	44 968	43 456	43 382	51 262	51 049	44 566	36 628	30 499
Developed market-economy countries	20 149	17 112	13 636	14 243	15 969	15 231	11 302	10 351	7 509
Developing countries	2 879	3 453	2 956	3 195	2 559	2 968	2 564	2 367	2 180
Countries of Eastern Europe	(18 394)	(17 403)	(18 064)	(17 444)	(14 234)	14 350)	(12 200)	(8 410)	(7 310)
Socialist countries of Asia	(6 000)	(7 000)	(8 800)	(8 500)	(18 500)	(18 500)	(18 500)	(15 500)	(13 500)
B. World production	48 099	46 741	44 767	40 492	51 570	52 122	44 411	35 825	28 864
Developed market-economy countries	11 970	11 390	9 030	4 323	5 177	5 106	4 727	2 986	3 229
Developing countries	9 079	8 301	6 687	5 619	5 543	5 166	3 834	3 989	3 105
Countries of Eastern Europe	(10 050)	)10 050)	(9 050)	(9 050)	(8 050)	(7 050)	(7 050)	(7 050)	(7 050)
Socialist countries of Asia	(17 000)	(17 000)	(20 000)	(21 500)	(32 800)	(34 800)	(28 800)	(21 800)	(15 300)
C. World Exports	26 121	26 592	23 392	22 457	23 360	24 906	16 539	11 931	7 057
Developed market-economy countries	8 264	7 893	4 833	3 137	3 758	2 978	2 707	2 696	1 519
Developing countries	7 145	6 747	5 394	6 415	4 248	4 714	4 060	4 808	3 540
Socialist countries of Asia	10 712	11 952	13 165	12 905	15 354	17 214	9 772	4 427	1 998
D. World Imports	26 931	25 136	20 899	19 889	23 594	23 695	18 759	14 426	6 734
Developed market-economy countries	16 120	13 053	8 937	9 794	13 997	13 489	10 050	9 596	3 638
Developing countries	1 467	3 230	2 948	1 651	1 373	2 886	2 509	2 370	2 736
Countries of Eastern Europe	9 344	8 853	9 014	8 444	8 224	7 320	6 200	2 460	360

Source: Tungsten Statistics, UNCTAD quarterly and annual bulletins, recent issues.

Parentheses ( ) denote estimates or apparent consumption

Annex II

Economic growth rates and forecasts in selected countries, 1983-1993 a/

Country/region	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Forecast 1993
World economy	2.6	4.5	3.3	3.0	3.4	4.3	3.1	1.7	-0.3	0.5	1.5
Developed market-economy countries	2.7	4.6	3.2	2.6	3.1	4.3	3.2	2.0	0.4	1.5	2.9
Canada	3.2	6.4	4.7	3.3	4.1	5.0	2.3	-0.6	-1.8	0.9	...
France	0.8	1.5	1.8	2.4	2.2	4.3	3.8	2.2	1.1	1.3	-0.8
Germany b/	1.5	2.8	2.0	2.3	1.4	3.5	4.0	4.9	3.6	1.5	-0.5
Italy	1.0	2.7	2.6	2.9	3.1	4.1	2.9	2.2	1.4	0.9	...
Japan	2.7	4.3	5.0	2.6	4.1	6.2	4.7	5.2	4.4	1.3	1.0
Sweden	1.8	4.0	2.2	2.2	2.8	2.3	2.4	0.7	-1.8	-1.7	-2.0
United Kingdom	3.7	2.3	3.7	4.1	4.8	4.3	2.1	0.5	-2.2	-0.6	1.3
USA	3.5	6.1	3.0	2.6	3.0	3.9	2.6	0.7	-1.3	2.1	2.6
Developing countries	1.2	3.2	3.3	3.6	3.8	3.4	3.6	3.1	3.1	5.1	5.5
Brazil	-3.4	5.1	8.0	7.4	3.6	-0.1	3.3	-4.1	1.2	-0.2	...
India	7.4	3.7	6.2	4.8	4.7	9.8	6.0	5.5	3.5	1.1	...
Republic of Korea	11.8	9.4	6.9	12.4	12.0	11.5	6.2	9.2	8.4	6.5	6.0
Mexico	-4.2	3.6	2.6	-3.8	1.9	1.5	3.2	4.0	4.0	2.8	...
Thailand	7.3	7.1	3.5	4.9	9.5	13.2	12.0	10.0	8.0	7.5	...
China c/	10.3	14.6	12.7	8.3	11.0	11.3	3.6	4.8	6.6	12.8	9.0
Countries of Eastern Europe d/	4.2	3.5	1.9	2.7	1.9	3.8	1.5	-6.3	-14.8	-7.5	a/ ...
CIS (ex-USSR) e/	4.2	2.9	1.6	2.3	1.6	4.4	2.4	-4.0	-15.0	-18.5	-10.0

Source: Handbook of International Trade and Development Statistics, UNCTAD, recent issues; World Economic Survey, United Nations (New York), recent issues; World Economic Outlook, IMF, recent issues; World Tables 1993, World Bank; Main Economic Indicators, OECD, recent issues.

a/ Rates refer to real gross domestic product or gross national product, unless otherwise specified.

b/ Not including eastern Germany. Figures for Germany prior to 3 October 1990 are indicated separately for the Federal Republic of Germany and the former German Democratic Republic. Statistics for the latter were previously shown with the countries of Eastern Europe.

c/ National income

d/ Net national product, excluding CIS

e/ Net national product

Annex III

Movements of tungsten stocks by type in selected countries, 1983-1992

(Metric tons of tungsten content)

End of year

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
A. Ores and concentrates										
Producers' stocks										
Australia	385	306	379	481	435	416	705	717	431	(16)
Bolivia	...	...	...	...	...	105	130	(210)	(200)	(200)
Brazil	17	17	17	875	...	70	84	-	-	-
France	159	76	85	205	65	-	-	-	-	-
India	11	32	54	50	50	57	10	11	13	(10)
Japan	32	39	27	26	21	41	72	75	101	(179)
Mexico	12	18	20	95	8	19	13	25	18	86
Peru	...	...	46	241	...	71	(54)	-	-	-
Portugal	370	251	305	1,042	941	970	1,057	1,180	634	709
Republic of Korea	76	231	200	44	45	(45)	-	-	-	-
Rwanda	40	48	...	(60)	10	10	10	22	-	-
Spain	75	114	84	50	62	47	45	20	-	-
Sweden	-	-	-	-	-	-	206	-	-	-
Thailand	834	804	1,029	1,025	1,100	1,295	1,487	1,553	1,617	(1,646)
Turkey	116	96	80	145	43	20	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-	-
USA	54	46	60	21	21	21	(10)	16	26	(20)
Sub-total	2,181	2,078	2,386	4,360	2,801	3,187	3,883	3,829	3,040	2,866
Consumers' stocks										
Canada	...	...	...	...	255	75	70	61	(53)	(50)
France	47	177	130	221	-	-	-	-	-	-
Japan	511	557	671	687	448	455	561	860	661	673
Republic of Korea	-	-	-	-	-	-	-	-	200	400
Portugal	5	3	10	1	-	1	1	1	(1)	(1)
Sweden	-	256	302	333	353	301	218	40	40	22
USA	1,085	959	1,077	502	329	499	1,261	1,077	1,778	702
Sub-total	1,648	1,952	2,190	1,744	1,385	1,331	2,111	2,039	2,733	1,848
Dealers' stocks										
Argentina	11	9	9	-	-	-	-	-	-	-
Japan	11	-	1	-	-	-	-	-	-	-
Peru	...	...	...	...	...	7	7	27	27	-
Thailand	462	339	113	116	120	51	107	83	26	30
Sub-total	484	348	123	116	120	58	114	110	53	30
Grand total	4,313	4,378	4,699	6,220	4,306	4,576	6,108	5,978	5,826	4,744
B. Ammonium paratungstate										
Bolivia	-	-	513	389	27	159	179	237	276	(250)
Republic of Korea		157	170	226	189	219	219	200	250	-
Sweden	-	-	76	318	126	306	467	340	332	420
USA a/	870	1,191	1,056	477	292	911	915	896	578	333
Total	870	1,348	1,815	1,410	634	1,595	1,780	1,673	1,436	1,003

Source: Tungsten Statistics, UNCTAD, quarterly and annual bulletins, recent issues and the Bureau of Mines, the United States Department of the Interior.

- Denotes negligible or nil. ... Denotes not available. ( ) Denote provisional estimates.

a/ Consumers' and producers' stocks only.

Annex IV

Number of tungsten mines in operation, 1980 and 1992

Country	1980	1992 a/
Developed market economy countries		
Australia	4	-
Austria	1	1
Canada b/	1	:
France	2	-
Japan	5	2
Portugal	6	1
Spain	8	-
Sweden	2	-
United Kingdom	1	-
United States	30	2
Total	60	6
Developing countries		
Argentina	14	1
Bolivia	6	8
Brazil	7	3
India	2	1
Mexico	5	5
Peru	2	2
Korea, Rep. of	10	-
Rwanda	10	1
Thailand	17	4
Turkey	1	-
Total	74	25

Source: Diverse sources including Tungsten Statistics, the quarterly bulletin of the UNCTAD Committee on Tungsten; The Economics of Tungsten, 1986, Roskill Information Service; International Journal of Refractory & Hard Metals (various issues).

a/ Refers to latest available data where such data are not available for 1992.

b/ There were only two major mines in Canada, namely Cantung and Mount Pleasant, the latter mine having been opened only in 1983. Both mines are now shut down.

Annex V

World exports and imports of tungsten by product:
1983 to 1992
(metric tons of tungsten content)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Exports										
Ferro-tungsten	792	1,211	1,513	1,511	2,640	4,159	4,419	5,258	3,028	2,000
Tungsten Oxides and hydroxides	1,677	2,358	2,822	1,661	1,512	975	2,269	912	2,215	1,000
Tungstates	2,263	2,116	3,199	3,854	4,775	10,198	12,019	8,545	10,413	5,900
Tungsten carbides	3,233	3,675	4,198	3,441	3,667	3,813	4,835	2,693	2,865	2,324
Unwrought tungsten	3,053	4,400	5,885	4,690	4,632	4,544	5,337	5,290	5,496	4,800
Total	11,018	13,760	17,617	15,157	17,226	23,689	28,879	22,698	24,017	16,024
Imports										
Ferro-tungsten	741	1,528	2,043	1,938	2,886	5,105	5,442	5,363	3,096	2,500
Tungsten Oxides and hydroxides	193	569	567	594	520	1,335	1,057	809	2,179	1,125
Tungstates	2,049	2,084	2,788	3,037	4,144	9,151	10,620	7,820	10,376	6,900
Tungsten carbides	2,598	3,098	3,189	3,045	2,832	3,619	4,138	3,443	2,571	2,405
Unwrought tungsten	3,186	4,385	5,140	4,561	4,927	5,703	6,015	6,062	7,184	5,257
Total	8,767	11,664	13,727	13,175	15,146	24,913	27,273	23,497	25,406	18,187

Source: Tungsten Statistics, UNCTAD quarterly and annual bulletins, recent issues.